3. PAPER FEED AREA

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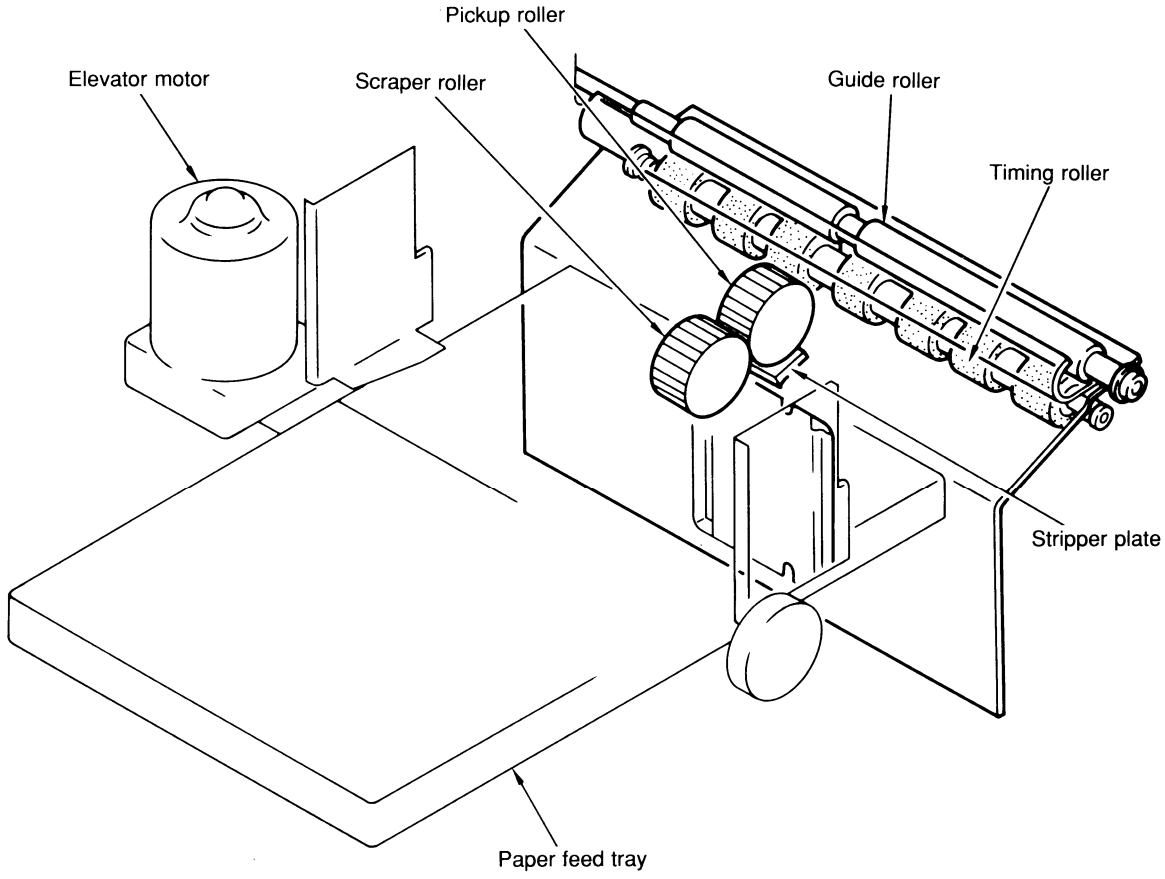
Operation and Function

The Paper feed tray is elevated by the Elevator motor. During printing,the tray is continuously raised to apply an appropriate pressure to the paper against the Scraper and Pickup rollers.

The raised position and function of the tray is controlled by the Elevator upper limit sensor.
When the Scraper and Pickup rollers are rotated, a single sheet of paper is separated from paper stack by the Stripper plate and fed to the second paper feed section.

Before the paper enters this section, the Timing roller rises up to the Guide roller to block the paper for re-feed. By changing the start-time of this re-feed, the vertical print position is adjusted.

The status of paper is checked by the Paper sensor in the above feed and re-feed operations.



1. Paper Feed Section

[Theory of Operation]

1. Paper Feed Tray Elevation System

- Basic

The Paper feed tray can elevate up and down depending upon the function that is selected or required.

- Elevation of Feed Tray

When paper is loaded onto the Paper feed tray, the light path of the Paper detection sensor is blocked.

If paper is present and the print "START" button is pressed, the Elevator motor starts to rotate counter-clockwise, causing the Elevator shaft to rotate clockwise via the Elevator bevel gears.
This rotation drives the Elevator pinion gears located on the left and right ends of the Elevator shaft. Therefore when the Elevator shaft rotates clockwise, the Elevator pinion gears clockwise on the Elevator rack and raise the Paper feed tray.
As the Paper feed tray elevates up, paper contacts and pushes up the actuator of the Elevator upper limit sensor.
This causes the light path of the sensor to open. The Elevator motor is then turned off and the Paper feed tray stops.

- Elevation during printing

As the paper supply decreases during printing,the actuator of the Elevator upper limit sensor lowers and blocks the light path of the sensor.
The Elevator motor is then activated to raise the Paper feed tray until the light path of the Elevator upper limit sensor opens.
This operation is repeated to maintain the paper feed tray at the appropriate height until the paper supply is depleted.

- Lowering of Feed Tray

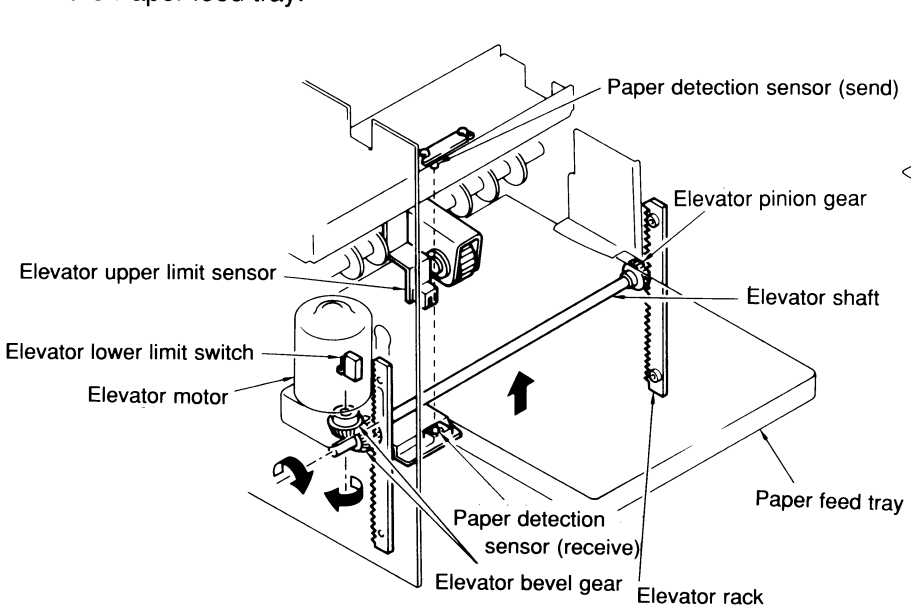
As the last sheet is fed from the Paper feed tray, the Paper detection sensor detects that the paper has run out.
The Elevator motor then rotates clockwise to lower the Paper feed tray.
As the Elevator motor is lowered, the Lower limit plate presses against the actuator of the Elevator lower limit switch and the Elevator motor is turned off.

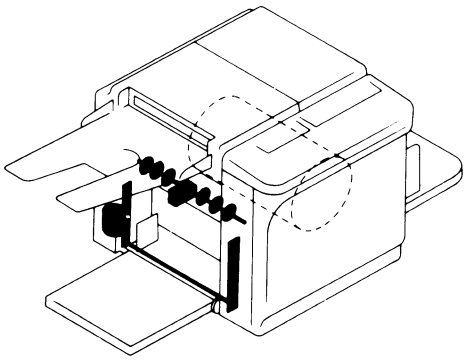
- In case Paper Feed Jam

If the paper jams in the paper feed area, the elevator motor is activated and rotates clockwise for 2 seconds to lower the Paper feed tray.

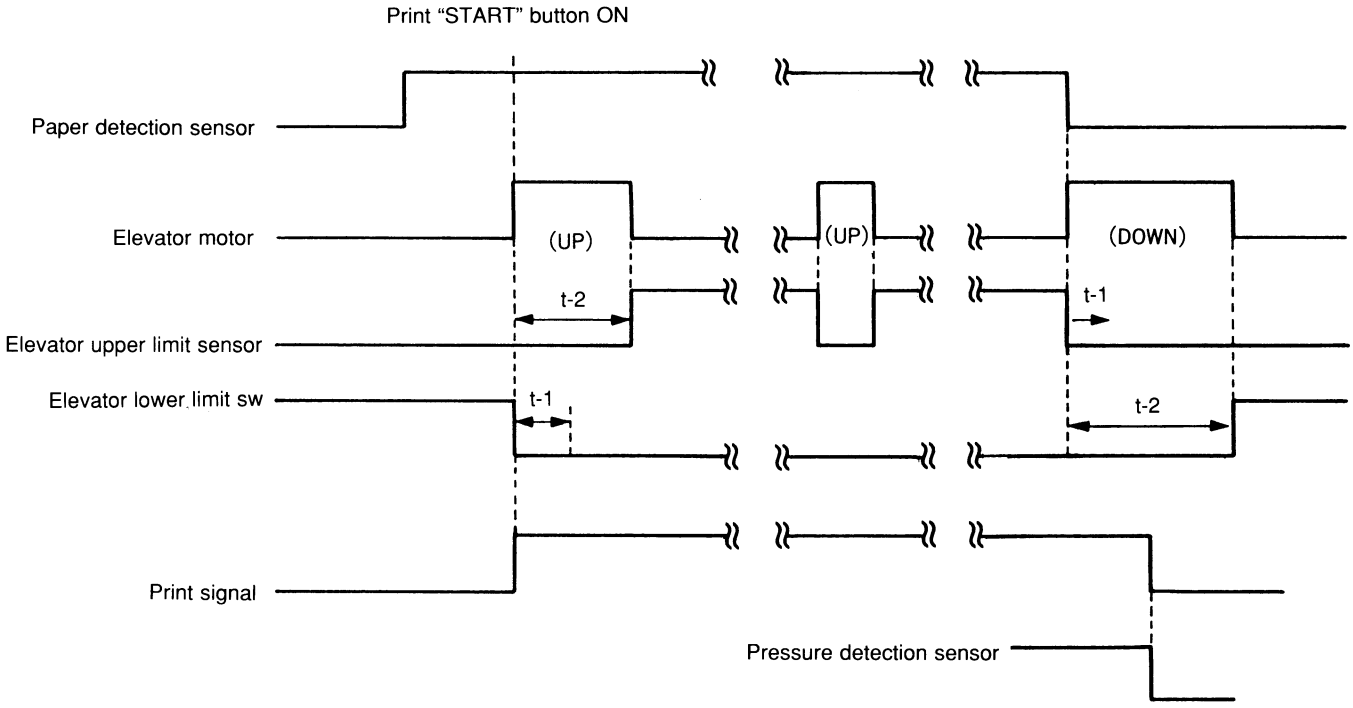
- Manual Lowering of Feed Tray

If the Feed-tray down button is being pressed, the Elevator motor rotates clockwise to completely lower the Paper feed tray.





Paper Feed Tray Elevation System



In both of the following cases, the display panel will indicate "T2:CALL SERVICE"

t-1: An error has occurred, if the actuator of the Elevator lower limit switch was not released as the Paper feed tray started to rise; or that the Elevator upper limit sensor's actuator did not block the light path of the sensor as the Paper feed tray started to lower, within **2 seconds** after the Elevator motor starts.

t-2: An error has occurred, if the actuator of the Elevator lower limit switch was not pressed on as the Paper feed tray started to lower; or that the Elevator upper limit sensor's actuator did not open the light path of the sensor as the Paper feed tray started to rise, within **7 seconds** after the elevator motor starts.

2. First Paper Feed Section Rotary System

- Basic

The Scraper and Pickup rollers are started by the operation of the Paper feed clutch.

- Paper feed clutch sensor & Paper buckle detection sensor

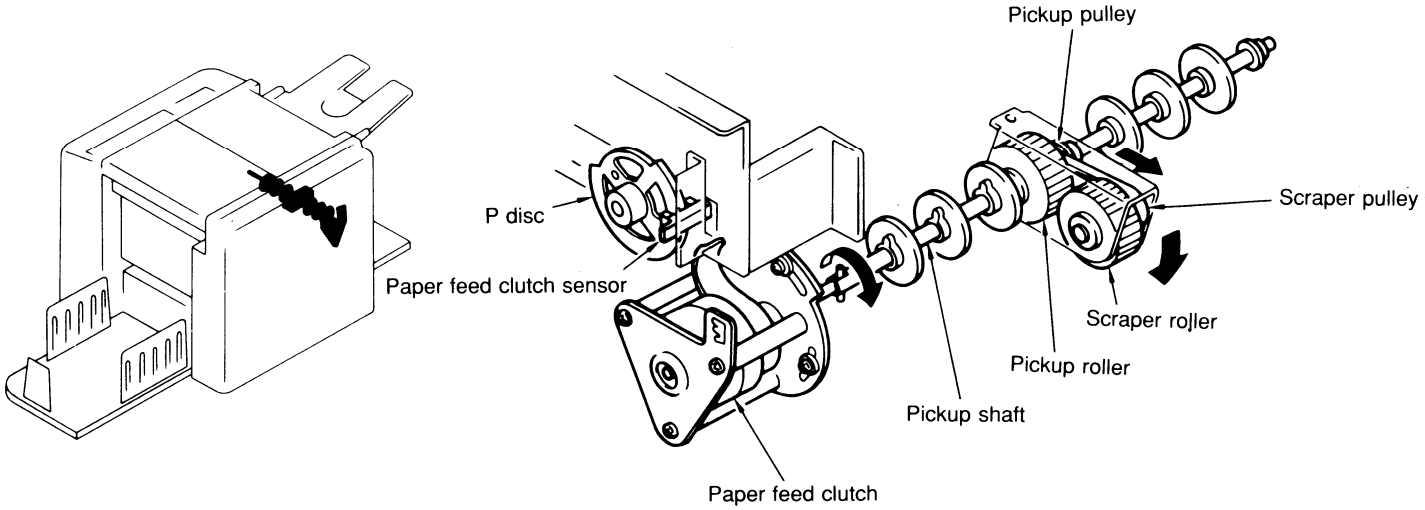
The Paper feed clutch is activated by the Paper feed clutch sensor.
When the main motor rotates during the print cycle, the P disc rotates through the Paper feed detection sensor.
If the light path of the Paper feed clutch sensor is opened during printing, the Paper feed clutch engages.
If the light path of the Paper feed clutch sensor is blocked, the Paper feed clutch disengages.
[NOTE]
When the Paper buckle detection sensor detects the ridge of the buckled paper, it will override the Paper feed clutch sensor and turn the Paper feed clutch OFF.

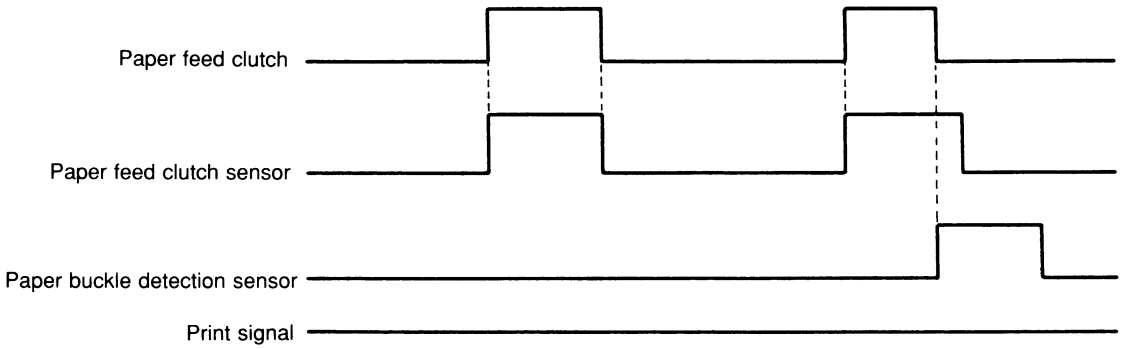
- Transmission of Rotation Power

The driving components of the Paper feed clutch are rotated by the main belt, and the driven components are connected to the Pickup shaft.
When the Paper feed clutch engages, the driving and driven components are engaged by the electro-magnet in the Paper feed clutch, transmitting the rotation of the main belt to the Pickup roller.
By this rotation transmission, the Pickup and Scraper rollers are driven to feed the paper up to the second paper feed section.
[NOTE]
The drive of the Scraper roller is provided by the Scraper pulley and belt, which is driven by the Pickup pulley attached to the Pickup shaft.

- Prevention of brake effect by Pickup and Scraper rollers

The Pickup and Scraper rollers have one-way bearings that allow the rollers to rotate freely as the paper is fed further from the second paper feed section.



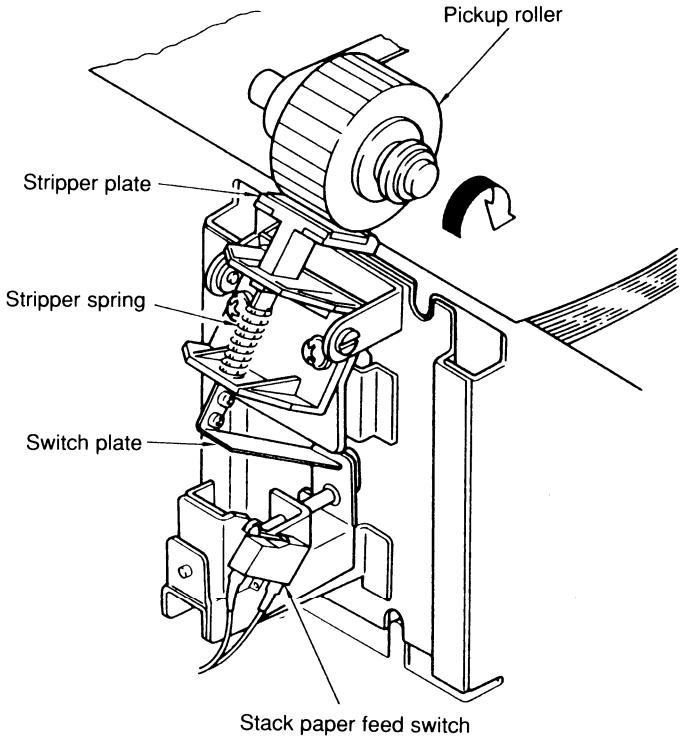


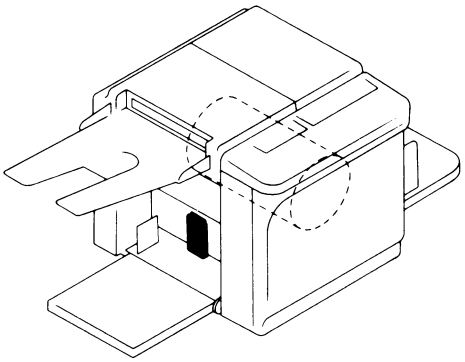
3. Paper Pickup System

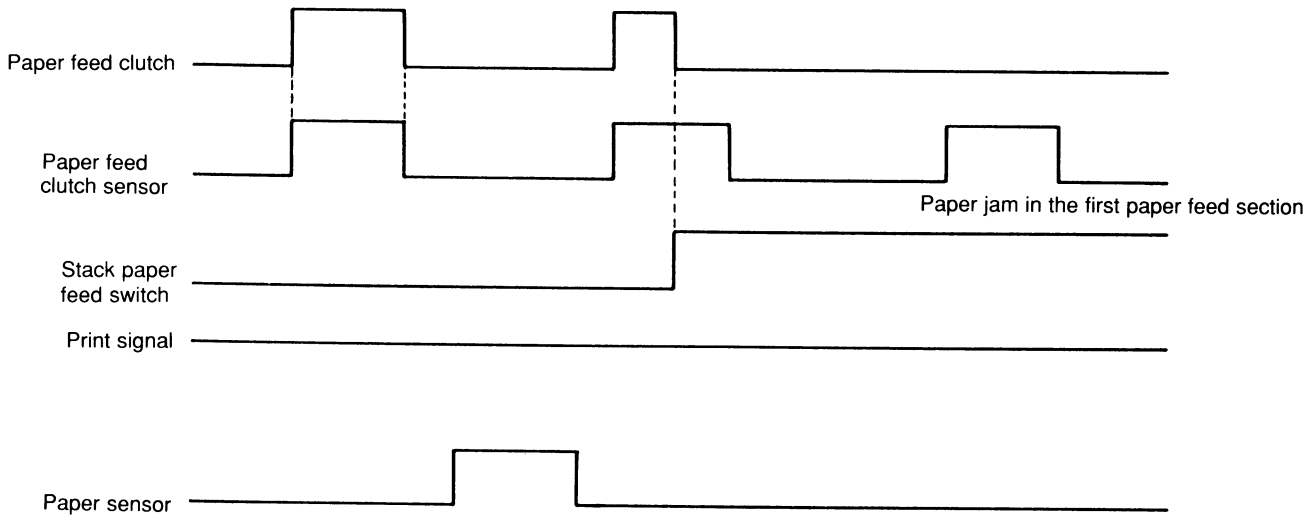
- Feeding
The paper on the Paper feed tray is fed by the Pickup roller.

- Pick-up
The Stripper plate is pressed against the Pickup roller by the Stripper spring to provide resistance against paper feed, by which only a single sheet of paper is fed from the paper stack.

- Detection of Stack paper feed
If multiple sheets of paper are fed, the Stripper plate is pushed down, causing the switch plate to contact the actuator of the Stack paper feed switch.
When the Stack paper feed switch is pressed, the Paper feed clutch is turned off to stop paper feeding.







4. Second Paper Feed System

- Rotation of the Guide roller

The Guide roller cam attached to the Cam pulley rotates clockwise when the Main motor rotates clockwise.
As the Guide roller cam rotates,the Guide cam follower, pressed against the cam by the Sector gear spring, follows the cam and is shifted up and down on the cam.
When the cam follower follows the Guide roller cam from the low point to the high one in the cam's rotation, the Sector gear is driven to rotate the Guide roller gear clockwise.

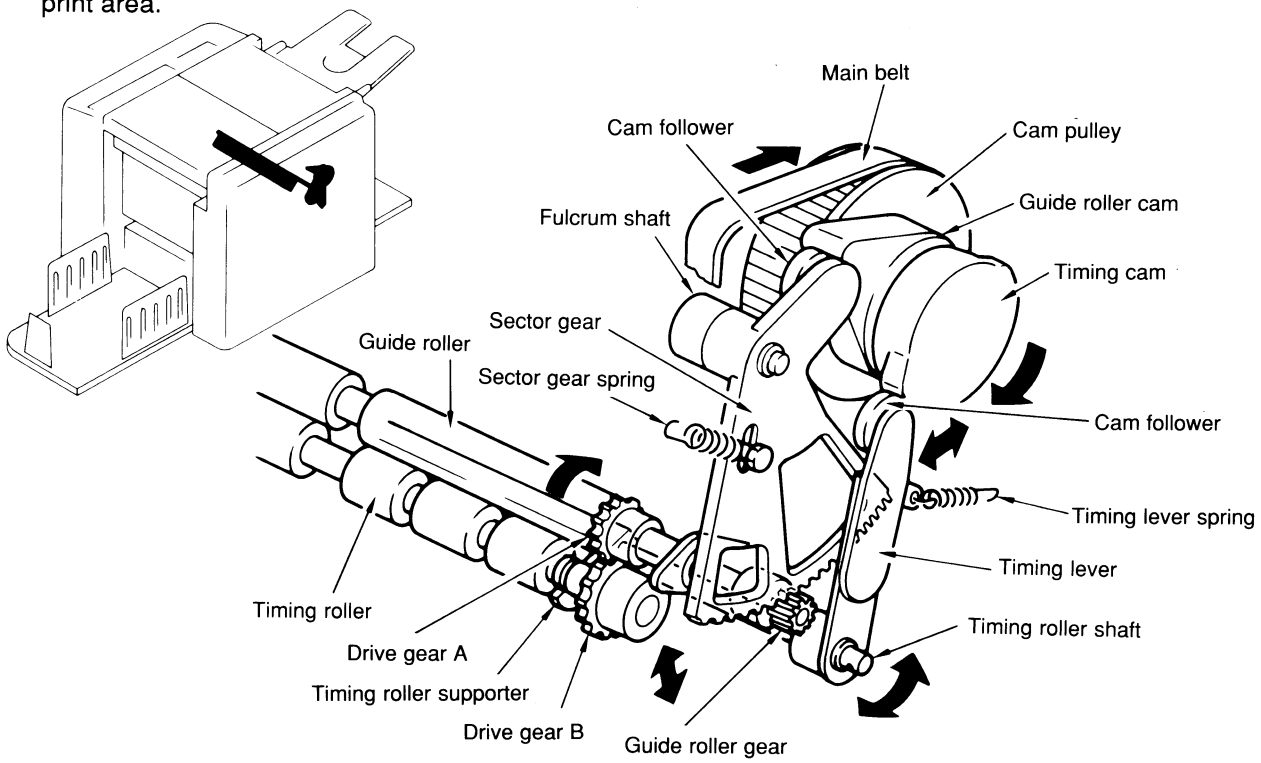
The Guide roller gear incorporates a one-way spring clutch to rotate the Guide roller only when the Guide roller gear is driven clockwise and not to transmit rotation to the Guide roller when the Guide roller gear rotates counter-clockwise.

- Rotation of Timing Roller

The Timing roller, which is raised and lowered against the Guide roller, is driven by the Drive gear A on the Guide roller and the Drive gear B on the Timing roller.
When the Timing roller is raised, the gear A and B engage and rotate simultaneously to feed the paper to the print area when the Guide roller is rotated.

- Rise and Lowering of the Timing roller

The Timing cam attached to the Cam pulley rotates clockwise when the Main motor rotates clockwise.
As the Timing cam rotates, the Timing cam follower on the Timing lever, pressed against the Timing cam by the Timing spring, follows the cam and is shifted up and down on the cam.
When the cam follower follows the Timing cam from the low point to the high one in the cam's rotation, the Timing lever is driven to rotate the Timing roller shaft counter-clockwise, lowering the Timing roller supporter.
On the other hand, when it follows the cam from the high to low, the Timing lever is driven to rotate the Timing roller shaft clockwise, raising the Timing roller supporter.
The Timing roller is mounted on the Timing roller supporter.
Therefore, when the Timing roller shaft rotates clockwise, the Timing Roller is raised to the Guide roller and is held in that position by the Timing lever spring.
As the Timing roller is raised to the Guide roller, the Drive gear A and B on the two rollers engage and the paper fed by the first paper feed is stopped by the rollers to create a buckle and then is fed to the print area.



5. Paper Feed Check System

<There are two kinds of check system for paper transportation in the paper feed area.>

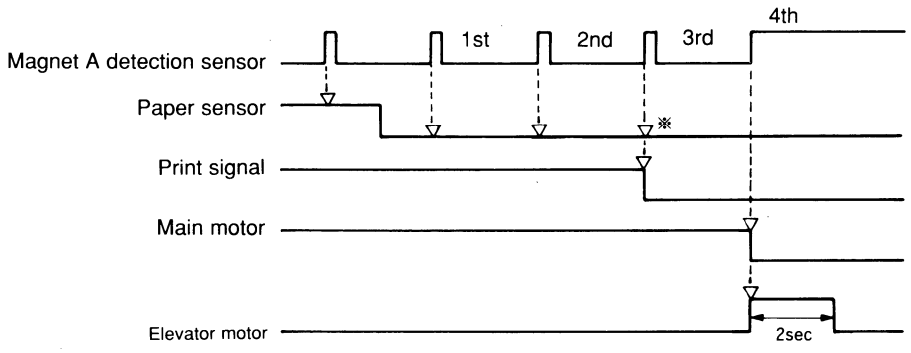
(1) Check of the paper jam in the first paper feed section

① During printing, it is checked at each detection of Magnet A if the light path of the Paper receiving sensor 1 is blocked.
② If the light path of the Paper sensor is opened before Magnet A detection, it is checked that the light path of the Paper receiving sensor 1 is opened at Magnet A detection position.(The Clamp plate points up.)
③ If the light path of the Paper sensor has been opened until Magnet A was detected twice after the above was checked, it is judged that paper has jammed in the first paper feed section, and paper feed is stopped with the interruption of the Print signal.
④ At the next detection of Magnet A, the Drum is stopped and the Elevator motor is rotated for two seconds to lower the Paper feed tray, after which the paper feed jam message is displayed on the panel.

(2) Check of the paper jam in the second paper feed section

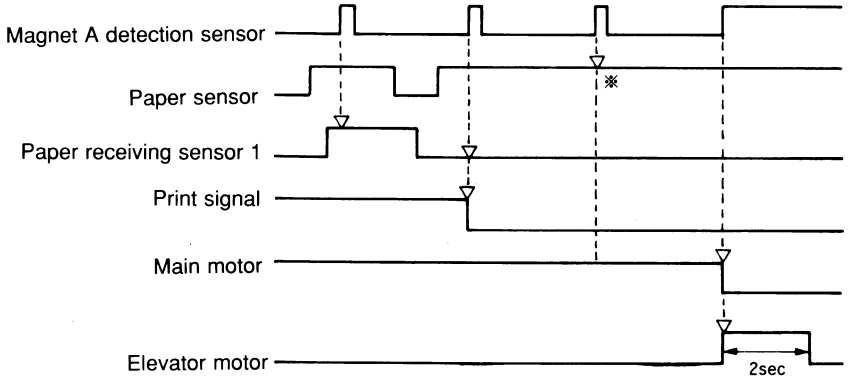
① During printing, it is checked at each detection of Magnet A if the light path of the Paper receiving sensor 1 is blocked.
② If at a detection of Magnet A, the light path of the Paper receiving sensor 1 is not blocked but that of the Paper sensor is, paper feed is immediately stopped with the interruption of the Print signal.
③ At the next detection of Magnet A, it is checked if the light path of the Paper sensor is blocked. If it is blocked, it is judged that paper has jammed in the second paper feed section and the paper feed jam message is displayed on the panel.
④ At the next detection of Magnet A, the drum is stopped and the Elevator motor is rotated for two seconds to lower the Paper feed tray.

(1) Paper Jam in the first paper feed section



※ Where concluded that paper has jammed in the first paper feed section.

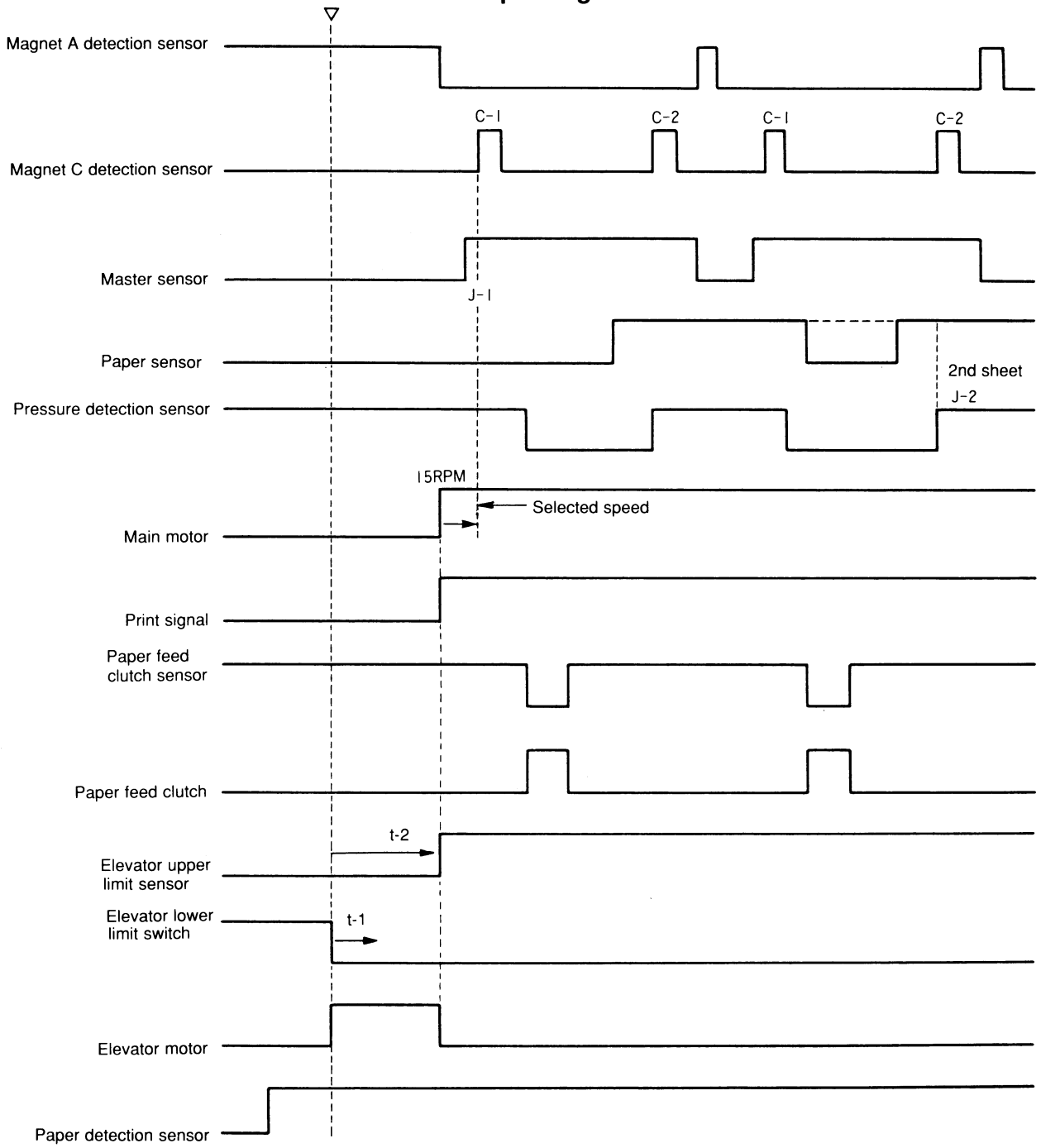
(2) Paper Jam in the second paper feed section



※ Where concluded that paper has jammed in the second paper feed section.

Total Timing Chart in Paper Feed Section

- In printing -



J-1: If the Master sensor does not detect the master at the first Magnet C detection (C-1) in printing, the print signal is turned OFF. At the next Magnet A detection, the drum is stopped and the error message **"NO MASTER ON DRUM/ SET ORIGINAL IN PLAC E AND PRESS START BUTTON"** is displayed on the panel.

J-2: If the light path of the Pressure detection sensor is blocked twice while the light path of the Paper sensor remains blocked, paper feed is stopped with the interruption of the Print signal and the Drum is stopped after the double detections of Magnet A, after which the jam message **"PAPER JAM/ CHECK PAPER FEED AREA"** is displayed on the panel.

t-1: The trouble message **"T2:CALL SERVICE"** is displayed if the Elevator lower limit switch's actuator is not released within **2 seconds** after the Elevator motor starts to rise.

t-2: The trouble message **"T2:CALL SERVICE"** is displayed if the light path of the Elevator upper limit sensor is not opened by the actuator within **7 seconds** after the Elevator motor starts to rise.